

# WORKSHOP FOR AFTERMARKET CATALYST REGULATORY CHANGES

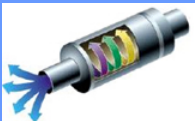
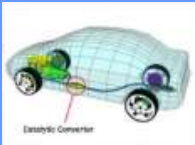
AIR RESOURCES BOARD

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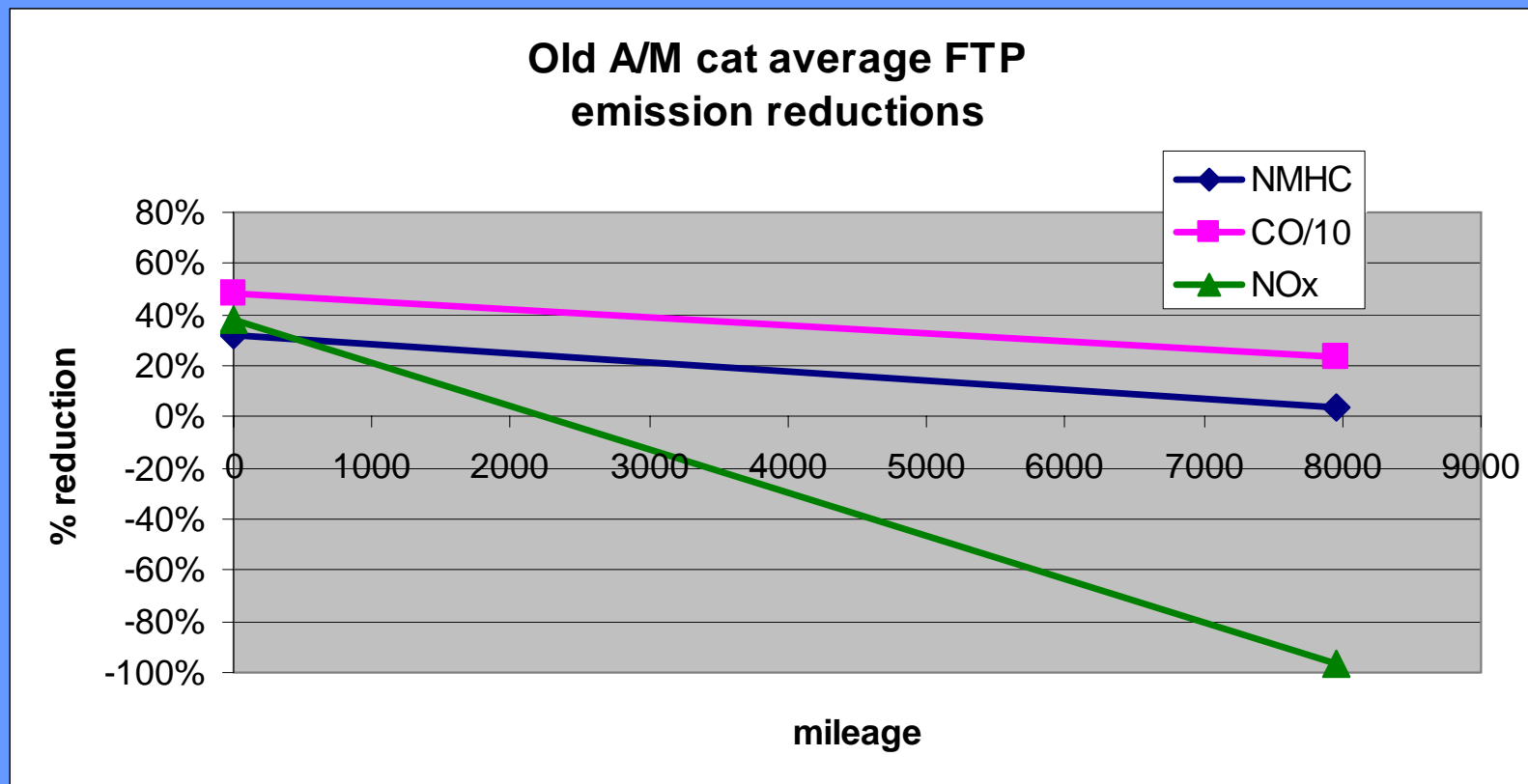
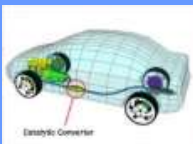
JUNE 15, 2005

## Agenda

- **Background**
- Title 13 changes
- Evaluation procedures
  - Durability, Emission performance, OBDII compatibility, and Warranty
  - Breadth of coverage
  - Labeling, Application documentation, and Installation limitations
  - Quality control, Warranty reporting, and Enforcement



## Performance on pre-OBDII vehicles



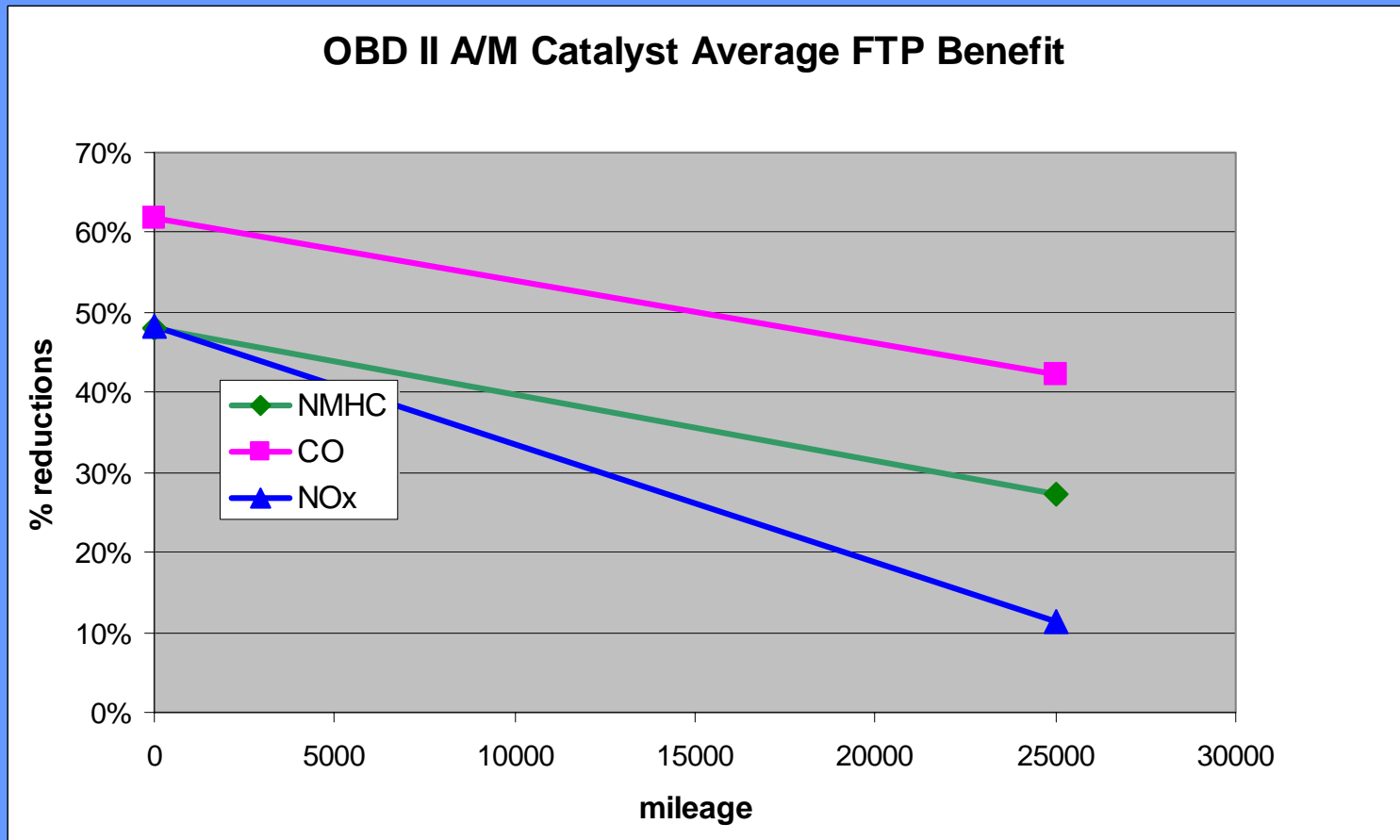
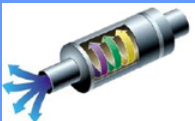
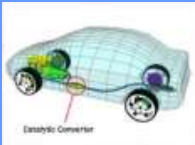
California Environmental Protection Agency

Vehicles re-procured after in-use mileage accumulation



**Air Resources Board**

## Performance on pre-OBDII vehicles



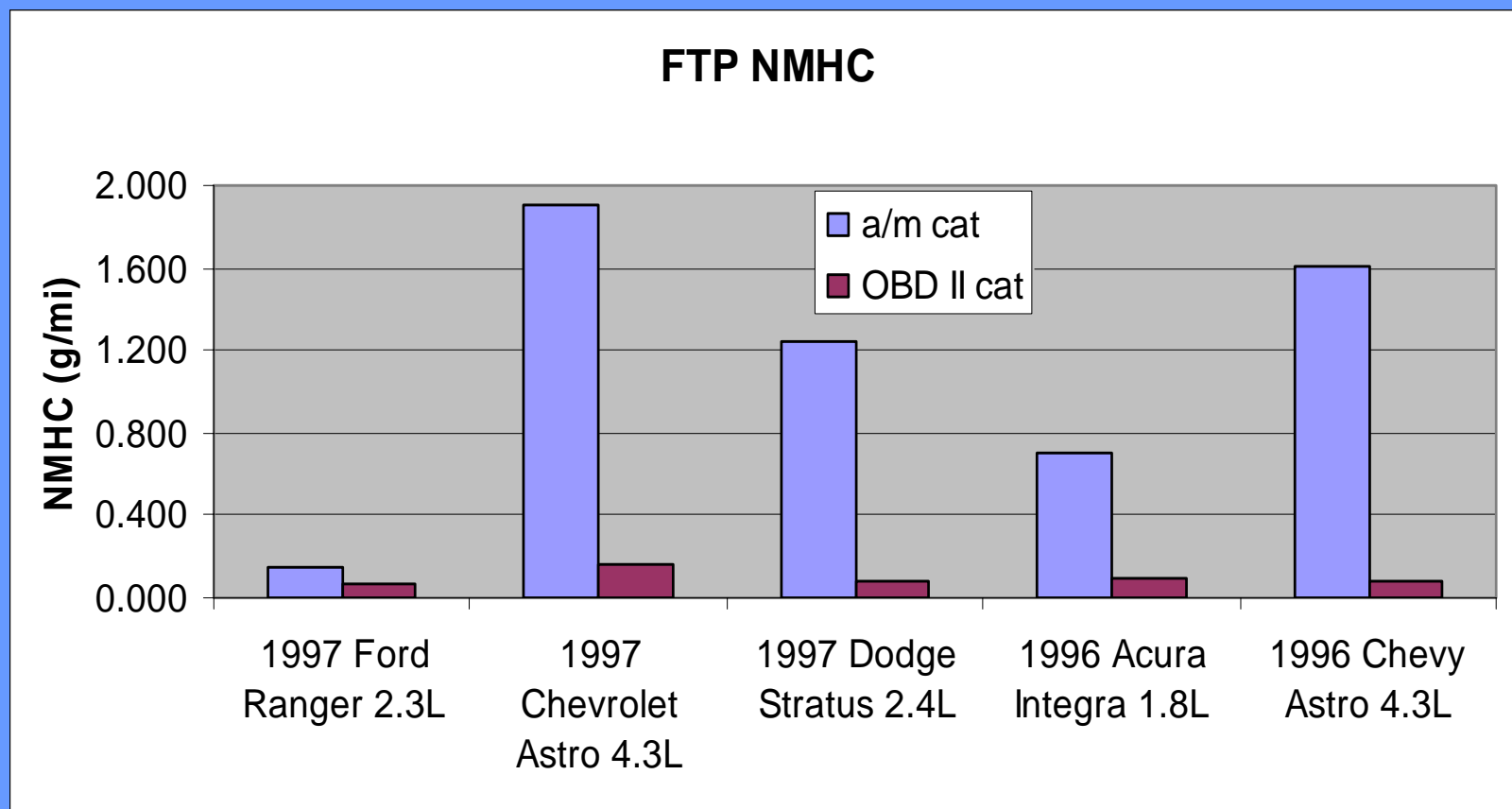
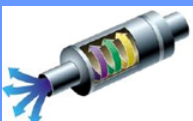
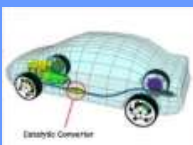
California Environmental Protection Agency



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Catalysts aged to 25k with CARB modified RAT-A cycle

## Disbenefit on OBD II vehicles

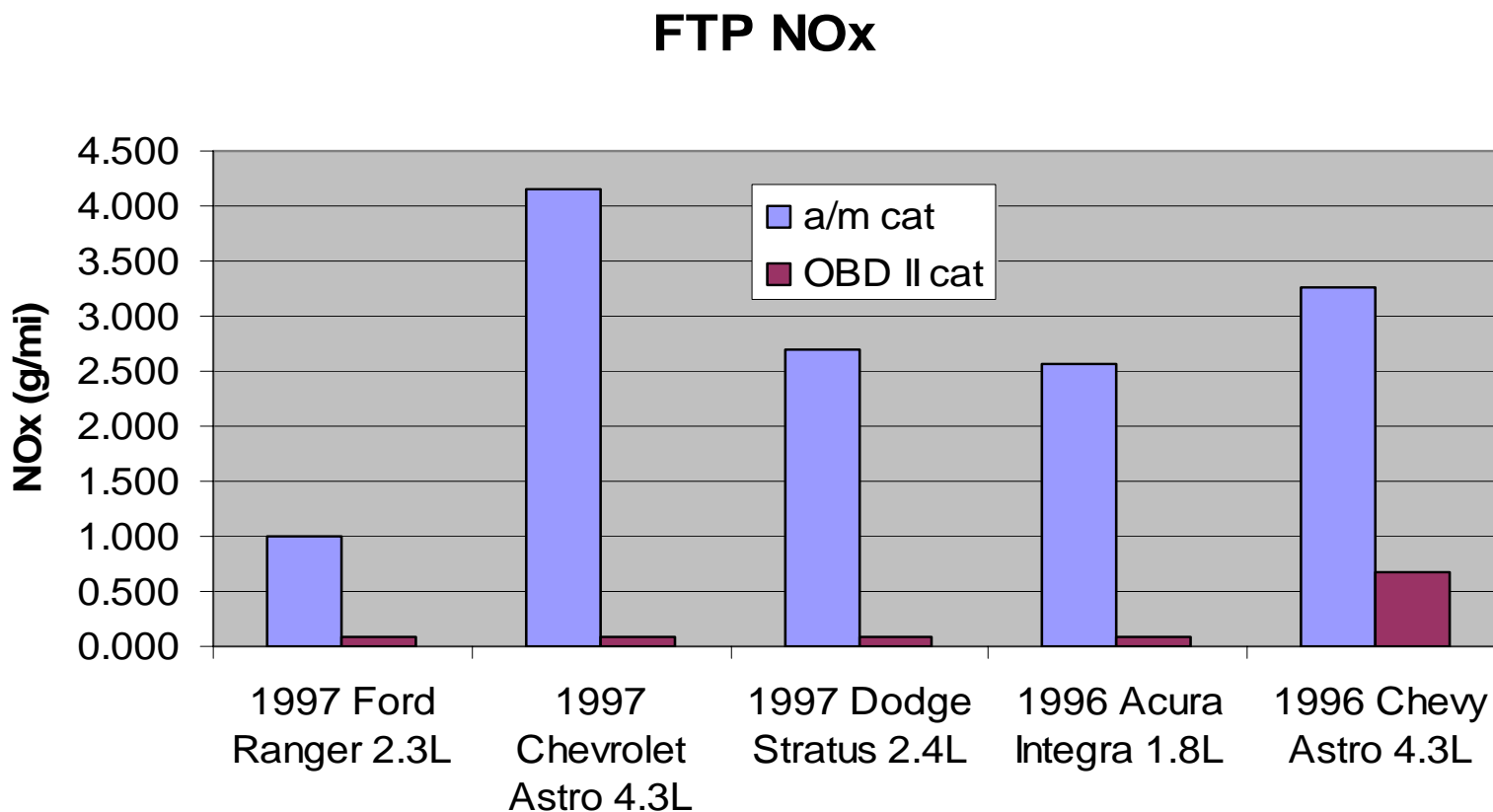
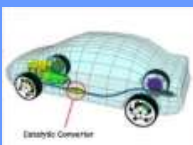


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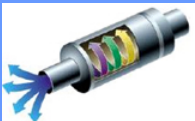
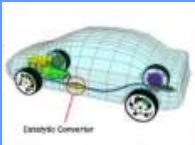


California Environmental Protection Agency



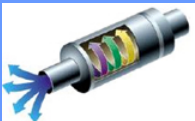
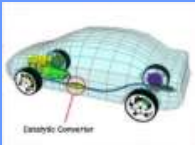
Air Resources Board

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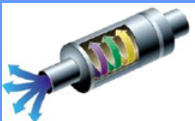
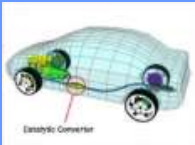
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## Title 13, CCR Section 2222



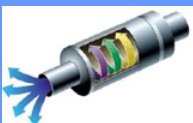
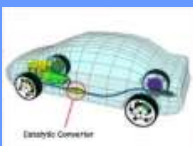
- Currently covers:
  - Replacement parts (e.g., EGR valves)
  - Add-on/modified parts (e.g., superchargers)
  - Aftermarket catalysts
- Sec. 2222 references applicable Evaluation Procedures
  - Separate procedures for add-on/modified parts and aftermarket cats
- Staff still considering revisions to sec. 2222 and/or creating new stand-alone section for aftermarket cats
  - Some redundancy for all three categories of parts but separate section may improve clarity of requirements
- Draft Title 13 language not yet available for review

## Title 13: Aftermarket cats



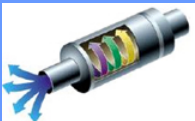
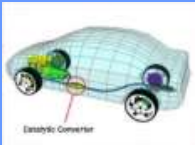
- Aftermarket cats must be exempted in CA
  - All cats must meet the criteria in the new Evaluation Procedure
    - Covers cats for all model years of vehicles
  - Exemption for all previously certified cats expires January 1, 2007 (tentative date)
    - Date must be OAL approval which can be up to 13 months after the Board Hearing
    - Includes expiration of pre-OBDII and OBDII cats
      - Current OBDII cats don't meet labeling requirements, etc.

## Title 13: Used cats



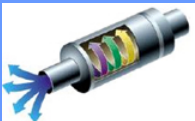
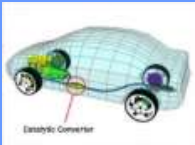
- Used/recycled/salvaged/rebuilt/remanufactured catalysts
  - Proposed changes would prohibit sale/installation/etc. altogether
  - No longer allow certification of used cats for re-sale (OEM or aftermarket)
  - Effective 90 days after filing with OAL
- Rationale:
  - Staff unable to identify an acceptable short test procedure to determine if catalyst is still “good enough” or how much life left in it.
    - Would likely require FTP test on actual identical vehicle for each cat
  - Unable to verify used cat will last for 50,000 miles or can be subjected to warranty for 5 years/50,000 miles
    - Seems appropriate that it be subjected at least to the same criteria as aftermarket cats

## Title 13: Used cats (cont.)

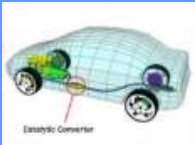


- Rationale (cont):
  - Verification of re-installation only on identically certified vehicle nearly impossible.
    - Differences between Fed and CA versions or year-to-year not easily identifiable from outside shell.
  - Most “used/rebuilt” cats being procured from vehicles that have their cats removed due to MIL illumination or I/M emission test failure
    - Inappropriate for them to be reintroduced into market
- However, staff still open to suggestions to demonstrate equivalence
  - Need to be worked out and included in regulatory language prior to Board Hearing in September 2005

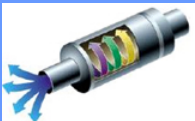
## Agenda



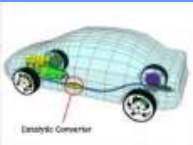
- Background
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## California Evaluation Procedures for Catalytic Converters



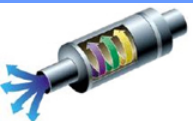
- Referred to by Title 13 section
- Contains the applicable performance criteria that cats must meet
  - Emission performance criteria
  - Test procedures
  - Application for exemption
  - Installation requirements, etc.
- Staff's proposal builds off of the interim procedure currently used for OBDII catalysts

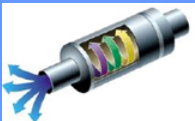
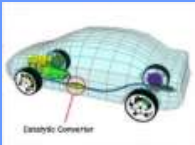


## Overview of Evaluation Procedures



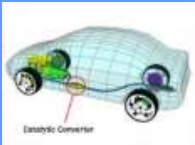
- Design cat to fit a group of vehicle models
- ARB picks test vehicle(s) from that group
- Age cat and perform FTP emission test to show it meets standards
- Submit final application for approval



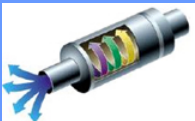


## Durability

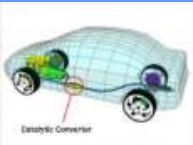
- Cat durability extended from 25,000 miles to 50,000 miles
  - Useful life on vehicles changed from 50k to 100/120k
  - Vehicles stay on the road longer than they used to
- Standardized durability demonstration procedure
  - Age cat on engine dyno in accordance with the ARB-modified Rapid Aging Test (RAT) to simulate 50,000 miles
  - PC/LDT1 applications aged 75 hrs
  - LDT2/MDV1 to MDV4 applications aged 100 hrs
  - No aging alternatives (e.g., mileage accumulation, other aging cycles)
- All cats and O<sub>2</sub> sensors aged in OEM configuration
  - May age in “worst case” configuration (shortest distance between front and rear cats) rather than in configuration of selected test vehicle
- Cat aging must be performed by ARB-approved independent lab



## Independent Lab Approval



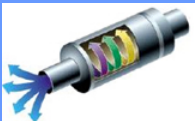
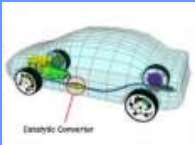
- Lab must demonstrate it can meet aging cycle conditions
  - Submit data, charts, etc. to show it can achieve specified conditions for four steps of aging cycle and transition between them as required
- Cat manufacturer shall maintain records demonstrating proper aging
  - Submitted to ARB upon request



## Emission Performance Criteria

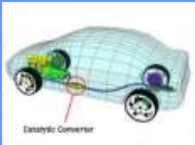


- Test vehicles must have minimum of 4k miles
  - Baseline test of vehicle must meet applicable FTP standards
- Run FTP emission test with 50k aged cat and O2 sensors installed
  - Must meet vehicle's full useful life (e.g., 100k) standard
  - Cannot cause OBDII system to detect a fault
- All emission tests must be performed by an independent testing facility
- ARB can request vehicle and aged parts to run confirmatory test
  - Request will be made by ARB within 30 days of submittal of emission data

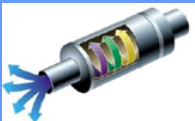


## Compatibility with OBDII

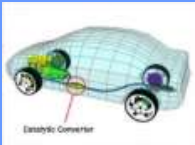
- Current procedures require minimal demonstration of compatibility
  - MIL not illuminated during emission testing with 50k cat
  - Report catalyst J1979 Mode \$06 test results from emission tests
    - Only gives an indication if cat is close to monitoring fail threshold
- What is really needed is assurance that aftermarket cat will have acceptable emission performance when the MIL eventually does come on
  - OEMs required to illuminate MIL before HC emissions exceed 1.75 x FTP HC standards
  - OEMs calibrate each vehicle model uniquely for the precise catalyst formulation and the oxygen storage to HC conversion efficiency relationship



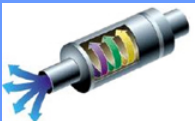
## Compatibility with OBDII (cont.)



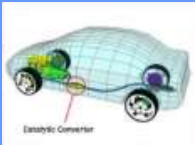
- Aftermarket cats don't automatically have the same oxygen storage to HC conversion efficiency relationship
  - Precious metal loadings, washcoats, ceria content, etc. affect it
  - Can result in emissions much higher or much lower than 1.75 x std when MIL finally comes on
- Staff is seeking input to a reasonable demonstration to identify what the emission level will likely be when cat reaches MIL illumination point.



## Compatibility with OBDII (cont.2)

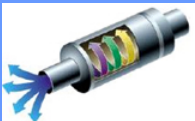


- Staff is proposing the following requirement for manufacturers:
  - Incrementally age the cat, install on the vehicle, exercise the catalyst monitor, and repeat until the MIL just illuminates.
  - Run an FTP test when MIL comes on and emissions must be less than 2.5x FTP HC full useful life standard
  - Aging must done on an engine dyno and manufacturer must document aging cycle used
  - Manufacturer subject to this demonstration on one catalyst per year
    - Selected by ARB
    - Effectiveness of requirement will be re-evaluated after three years
- Alternate approaches may include some objective measure of oxygen storage before/during/after 50k RAT-A aging?

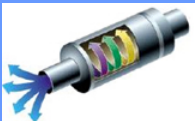
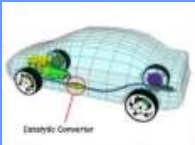


## Warranty Requirements

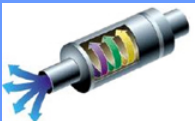
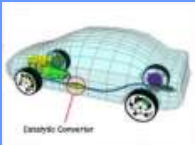
- Warranty extended to 5 years/50,000 miles from date of installation. Covers:
  - Defects in catalyst, external shell, end pipes, etc.
  - Cat malfunctions detected by OBD II or Smog Check
  - Parts and labor costs



## Agenda

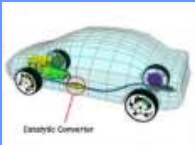


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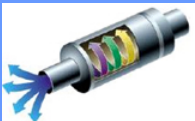


## Breadth of Coverage

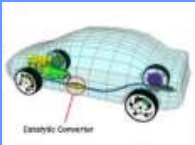
- Significant difference for pre-OBDII and OBDII vehicles
- Continues to be a difficult process for OBDII vehicles
  - Substantial differences in OEM configuration and catalyst composition makes it difficult to get broad coverage
- Staff proposal uses two different methods to determine coverage for pre-OBDII versus OBDII vehicles
  - Attempt to keep rules for pre-OBD as close as possible to current rules
  - Build off of interim OBDII procedure for OBDII vehicles
- For OBDII vehicles, trying to find a reasonable middle ground
  - Want assurance cat is actually going to work (emission performance wise, not just keep the MIL off)
  - Want to allow as broad of coverage as possible
  - Willing to accept some risk if there are some checks and balances in place



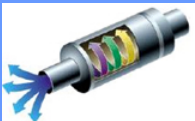
## Pre-OBDII Vehicle Coverage



- Analysis to date based on OBDII cats meeting LEV I standards
- Proposal is to require demonstration on LEV I or cleaner OBDII car and show it meets FTP standards
- Allow cat to be used on any pre-OBDII vehicle with equal or lower engine displacement and test weight
  - Since most pre-OBDII vehicles have a single underfloor catalyst, one issue may be finding enough suitable LEV I vehicles with a single catalyst configuration that could be used for testing
- Alternative proposal considered would allow cat demonstrated on a LEV I PC/LDT1 to be used on any pre-OBDII PC/LDT1 (and test a LEV I LDT2 to get LDT2 coverage, etc.)
  - Not constrained by engine size/test weight
  - May be more open to gaming by manufacturers to find vehicle that needs the lowest conversion efficiency to pass

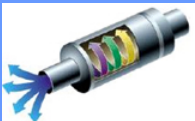
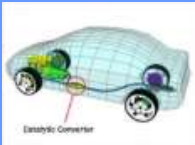


## OBDII Vehicle Coverage

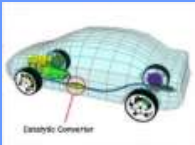


- Essentially same process currently used by interim OBDII
- Cat manufacturer identifies group of vehicle models that cat is designed to fit and have adequate performance
- Test vehicle(s) selected by ARB
  - Select based on a variety of factors including differences in systems, standards, configurations, OBDII monitoring strategies
- No further changes in the procedure proposed by staff
  - As mentioned earlier, still open for additional suggestions in this area.

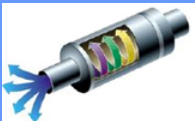
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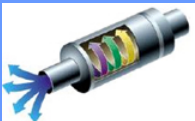
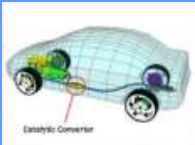


## Cat Label Requirements



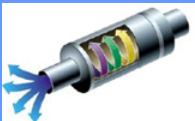
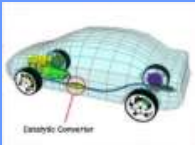
- Label on cat is key item needed to improve enforcement
  - Needed to make Smog Check inspection viable
  - Needed to simplify ARB/BAR inspection
- Current label does not provide sufficient information
  - Series number doesn't tell you if correct cat is actually installed
  - No easy way to look up series number or manufacturer number and decipher it
- Current label not always visible/readable after installation
  - Label placed towards underbody of car, etc.

## Required Cat Label Information

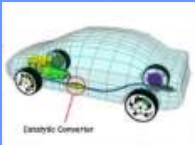


- Executive Order number
  - Identifies specific EO that applies
  - Harmonizes with the rest of Smog Check visual inspection of add-on/modified parts that verify based on EO
- Cat part number
  - Specific part number needed to identify exact part within a series that is installed
  - Series number insufficient because it includes various inlet/outlet configurations and O2 sensor locations
    - Relocating O2 sensor is illegal
- Date (month and year) of manufacture
  - Helps identify cats imported and installed after sunset of old cats
  - Helps verify whether warranty coverage is still valid

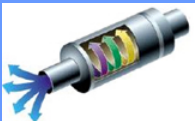
## Other Cat Label Requirements



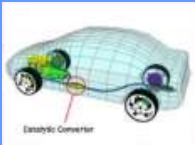
- Label must be permanent and indestructible
  - Attached/stamped on exterior shell
- Must be placed in a location easily visible after installation
  - Will likely require multi-sided labeling
  - Minimum font size and/or label size to be specified for ease of inspection
  - Possibility to specify label location?
- All cats must be stamped with a flow direction indication (e.g., arrow)
  - Provides installer with easy verification/confidence that cat is installed correctly
  - Ensures O<sub>2</sub> bosses integrated into catalyst end up in the right place
  - Ensures flow direction-specific cats (if any) installed correctly
- Samples of labels must be submitted to ARB for approval



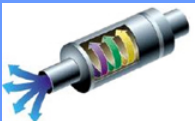
## Application for Exemption



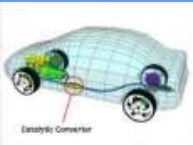
- No major changes here
- Must include:
  - Cat supplier and contact information
  - Details for: substrate, washcoat, active material, container
  - Instructions to installers to identify proper cat to use
  - Installation instructions
  - Emission test results
  - Warranty and safety statement
  - Samples of labels and packaging materials
- Vehicle Application Catalog (VAC)



## Vehicle Application Catalog

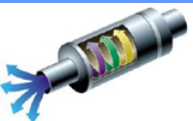


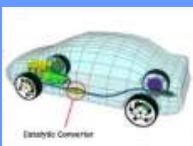
- Must be specific to California applications
  - Federal rules very different and not applicable
  - No longer allowed to bury the CA rules somewhere in the back
- Must be divided in two sections for OBDII and pre-OBD vehicles:
  - Application rules very different
  - Want to ensure “one-size-fits-all” selection process is not mistakenly applied to OBDII vehicles



## Vehicle Application Catalog (cont.)

- For OBDII vehicles, catalog:
  - Must have look-up function by make, model year, model, engine displacement, and emission standard/engine family (if necessary to differentiate) to identify proper cat for installation.
    - Intent is to shift installers to use look-up function based on vehicle model (just like catalogs for other parts such as oil filters, air filters, etc.)
  - Not allowed to list cats by model, shape, inlet/outlet diameters, etc.
    - Such listings easily lead to misapplication and reinforce “find one that fits” approach instead of identifying the right cat for the vehicle
  - Intent is to standardize the template for the look-up function and make it available electronically
    - Will allow installers to access most current electronic version of the catalog
    - Will simplify enforcement by allowing Smog Check inspector to verify correct part installed



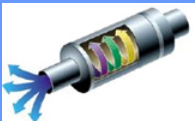
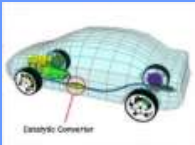


## Installation requirements

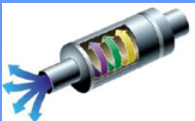
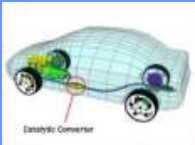


- One page in catalog must be dedicated to installation instructions/restrictions for OBDII vehicles
  - Might require it to be a “tear-out” page for posting on wall
- Prefer to create standard language for all manufacturers to use
  - Could also be better reinforced/taught and distributed to installers
  - Could also be used to ensure enforcement is objective
- Needs to include restrictions on installation:
  - Cat must be installed in same location as OEM cat
    - Front face within +/- 3 inches of OEM cat front face
  - Installed on a one-for-one basis and with all other required cats
    - No consolidating of cats or individual installation of cats certified together
  - Cannot relocate or change orientation of O2 sensors
    - Same relative position (upstream, downstream, etc.)
    - Within +/- 3 inches and oriented within +/-45 degrees of original location
    - Must see same flow contribution of cylinders (in collector after “y”, before collector, etc.)

## Installation requirements (cont.)



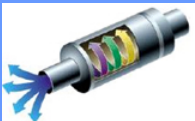
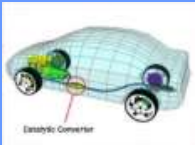
- Only for vehicles out of OEM cat warranty
  - Minimum OEM warranty is 7 yrs/70,000 miles
  - Can also be 8 years/80,000 miles or
  - Can be 15 years/150,000 miles (PZEVs)
- Remove allowance for within warranty replacement with aftermarket cat
  - E.g., due to tampering, crash damage, or if Smog Check determines the vehicle needs a new cat.
  - ARB relying on emission benefits for most of useful life with OEM cat so inappropriate to allow cat replacement with a less effective part during useful life.
- Require installer to maintain records of installation



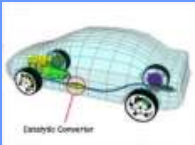
## Customer notification of warranty

- Cat manufacturer shall provide a means for installer to affix a warranty statement directly to the customer's repair invoice
  - Include terms of the warranty and a place for the customer's signature/initials
  - All repairs done by shops required to have repair invoice and have customer sign it so this minimizes burden on installers while achieving improved customer notification of warranty
  - Improves enforcement capability on installers not doing it right
- Statement must be affixed to invoice permanently
  - E.g., ink stamp, sticker, etc.
  - Cannot be a separate attached sheet or card
- Sample of warranty statement and means for affixing to invoice must be submitted with application for exemption

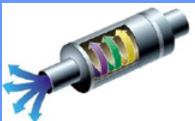
## Agenda



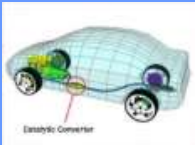
- Background
- Title 13 changes
- Evaluation procedures
  - Durability, Emission performance, OBDII compatibility, and Warranty
  - Breadth of coverage
  - Labeling, Application documentation, and Installation limitations
  - **Quality control, Warranty reporting, and Enforcement**



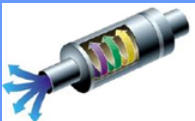
## Quality Control (QC) Procedures



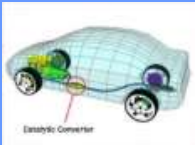
- Current production audit testing procedure rarely used
  - Most choose option of getting QC procedures approved
- Proposal makes QC procedure approval the default and production audit testing the alternative
  - Still believe this is necessary as a safeguard to ensure manufacturers are producing what they certified
- QC procedures must be ARB approved prior to production
  - Must demonstrate that process will produce cats consistent in quality and in accordance with granted exemption
- Executive Order can be revoked if approved QC procedures are not followed



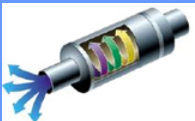
## QC Procedure Approval



- Staff still looking for suggestions for ways to clarify what is necessary for approval
  - Intent to make approval more objective and simple for staff to evaluate
- Also investigating methods to be able to trigger production audit testing
  - If evidence suggests manufacturer may not be producing equivalent cats, trigger testing (at cat manufacturer's expense) to verify
  - Not sure the appropriate trigger mechanisms
  - Not sure what an appropriate test would be
    - FTP test, conversion efficiency test, chemical analysis, etc.
    - Green cat, de-greened cat, 50k modified RAT-A aged cat, etc.

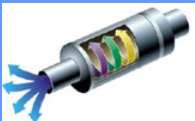
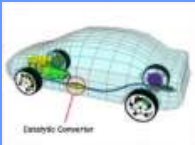


## Warranty Reporting

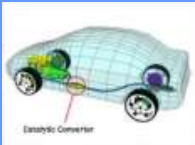


- Proposal includes a requirement for cat manufacturers to track warranty claims and report high rates to ARB
  - One safeguard staff is considering that would offset broader coverage/less testing for OBDII vehicles
  - If a manufacturer erred in determining that a particular catalyst would work sufficiently on a vehicle model, warranty tracking might reveal it
- Proposal requires warranty rates reported to ARB in an electronic format including:
  - Cat information
    - Series and Part number
    - Sales numbers and warranty claim numbers
  - Warranty claim information:
    - Make, model, model year, engine size, VIN, and odometer reading
    - Date of installation
- Would require installer to submit install information to manufacturer
  - Could be done with electronic form instead of paper

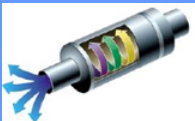
## Enforcement



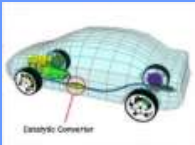
- Several changes proposed today to improve enforcement capability on installers
- Have worked with representatives from BAR to identify necessary items to improve inspection capability
- Foresee several potential stages of increased stringency in Smog Check inspections
  - Fail OBDII vehicles with aftermarket cats using secondary air injection pipes
  - Fail OBDII vehicles with a catalyst without an EO number
  - Fail OBDII vehicles with wrong EO number cat installed
  - Fail OBDII vehicles with wrong part number installed



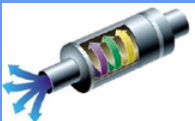
## Enforcement on Installers/Distributors



- Enforcement capability improvements related to installers
  - Inventory of non-CARB exempted cats after sunset date
  - OBDII vehicles without EO catalysts installed
  - Pre-OBD vehicles with non-CARB exempted cats manufactured after sunset date
  - Part number incorrect for vehicle
- Enforcement capability improvements related to distributors
  - Check sales/delivery records for non-exempted cats to California
  - Check inventory for non-exempted cats relative to sales inside/outside of California

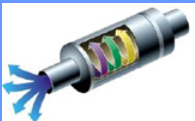
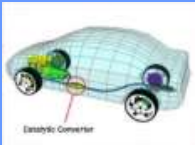


## Enforcement on Manufacturers



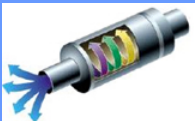
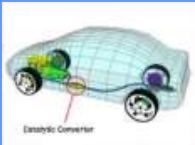
- ARB will inspect cat manufacturer facilities and randomly select and test production units for enforcement purposes
  - Can get cats from manufacturer, distributor, or shop
  - Proposal would require manufacturer to pay for 50k RAT-A aging of cats selected by ARB for testing
    - Would be done at independent lab chosen by ARB
    - Would be limited to no more than five cats per year per manufacturer
  - ARB would then test cats on applicable vehicles for compliance with FTP standards
- ARB may inspect sales/delivery records for non-exempted cats being sent for California installation

## Enforcement Options



- Applicable to any person advertising, offering for sale, selling, or installing
- Can invoke cease and desist provisions, stop sales, recall non-complying parts already sold, and impose fines
- Can revoke EO for exempted catalysts
- Fines up to \$500 per incident for installers, others.
- District Attorney/Attorney General can tack on business and professions code violations (up to \$5,000/violation plus up to six months jail time)

# *Air Resources Board*



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